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AUTHOR Hayes, Robert M.
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ABSTRACT

A study was made to develop a rationale for determining the economic justification for a national program of library and information services as described in the second draft of the National Commission on Libraries and Information Services Program Document. The economic rationale is based on improved cost effectiveness and improved utilization of capital resources. In finding formulas for assignment of financial responsibility to various levels of government and segments of society, several principles must be considered. Public, academic, special, and school libraries should continue to be funded by their constituencies with state and federal help where needed, while new public libraries should be funded by a mix of local, state, and federal funds. System, state, regional, and national resources should be supported by their constituencies, but should be given state and federal aid for services provided outside their constituencies. The federal government should fund the capital costs of the network, while the capital costs of resources should be born by the private sector or the constituency served. Research, development, and staff training should be funded by the responsible institutions, but the federal government should fund programs to meet the needs generated by the national network. (Author/LS)

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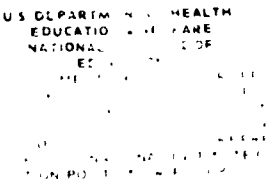

THE NATIONAL LIBRARY NETWORK
ITS ECONOMIC RATIONALE & FUNDING

ROBERT M. HAYES

DEAN, GRADUATE SCHOOL OF LIBRARY AND INFORMATION SCIENCE
UNIVERSITY OF CALIFORNIA

Developing the rationale for determining the economic justification for a national program of library and information services as described in the second draft of the NCLIS Program Document. Questions answered include: Are there quantitative and qualitative criteria for judging the value of such a program to the nation? What are the necessary funding formulas with the local, state, multistate and private sectors to promote consortia, networks and other cooperative programs at all levels?

DECEMBER, 1974

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1. INTRODUCTION & SUMMARY

This report is one of several commissioned by the National Commission on Libraries and Information Science as "related papers" for the national program that has been drafted by the NCLIS.[1] It is specifically concerned with two fundamental questions:

(1) What criteria can be used for judging the economic value of such a program?

(2) What funding formulas can be used for appropriate assignment of financial responsibility to various levels of government and various segments of society?

By their nature, these are almost unanswerable questions. All that one can do is to provide a rationale for particular approaches to answering them. This paper is, therefore, not a research study. It does not present the accumulation of data nor the evaluation of alternatives. Instead, it presents a particular rationale, as an advocacy position, and provides an analysis of the likely future effects of that rationale.

THE NCLIS PROGRAM

To set the stage, it is important to review the objectives of the NCLIS program itself, so that the rationale to be presented is seen in the context of those objectives. As identified by the draft program, those objectives are as follows:[2]

(1) To develop the resources needed for high quality information and library services;

(2) To create a national network that will provide access to those resources for all the citizens of the country.

These objectives are predicated on the assumption that "information" is an important economic and cultural asset, that it represents a significant capital investment which should be effectively used to provide the maximum possible return, and that to do so requires the development of more effective means for access to information resources. The NCLIS program thus emphasizes a "user orientation", an approach that starts from a view of the needs of individuals for access to information and then develops the system design as the means for meeting those needs most effectively and economically.

Underlying the NCLIS program are some even more basic assumptions about the proper role of government, especially the federal government, in any national enterprise. The NCLIS program thus emphasizes cooperation, rather than centralized direction; local responsibility, rather than federal control; individual rights, rather than public demands. On the other hand, the NCLIS program is built upon the historical tradition of public, governmental support to libraries, especially of public libraries and state university libraries. It, therefore, views the role of the private sector of the economy as provider of information to be accessed through the network and as resources to be drawn on through the network, rather than as the primary basis for the network.

These assumptions concerning the proper role of government are especially important to the purpose of this paper, since they lead to particular approaches to the

rationales for the network and its funding - approaches very different from those that other assumptions would imply. It's important from the outset, therefore, to recognize the implications of these assumptions in contrast to alternatives. For example, the assumption could be made, explicitly or implicitly, that the federal government should play a highly directive role, developing the national information network as a total, national resource and integrating libraries and other information agencies into the network. This would imply, of course, a total funding of the network by the federal government. Alternatively, it could be argued that information, like any other commodity in our economy, should be governed by the decisions of the market place, and thus as a privately capitalized enterprise with services provided for a fee. This would imply a funding of the network primarily from private funds, with government funding serving merely as facilitation.

The assumptions of the NCLIS draft program seem to strike a proper middle ground as well as being consistent with the historical patterns in library service. Furthermore, as will be argued later, they recognize the fact that information is primarily a social resource rather than a private one. But whether or not the assumptions of the draft program are the proper ones or not, they are the ones on which this paper is based.

THE ECONOMIC ISSUES

As was indicated above, this paper is concerned with two fundamental questions relating to economic issues about the network, its value, and its funding. The facts are that it is very difficult to provide tangible evidence of the economic value of information. Of course, these are speci-

fic situations that can be identified in which the value - economic or otherwise - is clear. But in general, while we may pay lip service to a belief in the value of information, the facts are that its value is quite intangible. While we may say that "information is the essential ingredient in decision-making", the facts are that information is usually used to justify decisions that have already been made, not to arrive at those decisions. While the words carved in stone may say, "The library is the heart of the university," the facts are that library budgets are the first to feel the effects of budget cuts. While we may call the public library "the university of the people", the facts are that it faces decreasing use and reduced budgets. While we may say that information is essential to scientific and technological progress, the facts are information services to science and engineering have suffered budget cuts as severe as other information activities.

Unfortunately, in a context where the pious words are at such variance with the economic reality, the justification for a netowrk is likely to be based on reduction of costs, on saving of money by sharing of resources, rather than the greater service it will provide to more people. It is this that represents the fundamental problem with which this paper is concerned, because to do so would destroy the real purpose of any system for providing access to the nation's information resources.

The issue of providing a rationale for distribution of responsibility for funding of the network is a much simpler task. There are a number of well established principles and experience in the operation of specific formulas on which to base one for funding of the network. The task here is therefore one of showing how a particular funding formula would operate in practice.

THE APPROACH TO ANALYSIS

The approach taken to analysis of these two questions is the standard systems analysis methodology. It involves an analysis of the national network into components and functions, the assignment of responsibility for particular functions to one or more system components, the evaluation of the cost/effectiveness of their individual operation, and the derivation from those measures of the comparable measure of the cost/effectiveness of the system as a whole. Based on this analysis, one can then derive both a rationale for the value of the network in comparison with other alternatives and for the allocation of costs to various funding agencies.

In Section 2 of this paper, we provide such an analysis. There is nothing startling or new in the means of identifying either components or functions. The traditional divisions used in describing the fields of librarianship and information science are used here again. The library agencies are defined in terms of types of library (public, school, academic, and special); the information agencies, in terms of types of service (dissemination, information retrieval, information analysis, publication and distribution). These components are organized into levels of structure, consistent with the pattern of the NCLIS draft program - service points, local systems, states and regions, national services. The functions are those traditionally involved in the operation of libraries and information agencies - acquisition, identification, storage and retrieval, analysis, publication.

The assignment of functions to components and the evaluation of their individual cost/effectiveness may be

somewhat more controversial. First, the assignment embodies a view of the network and its operation that is more specific than the NCLIS draft program itself; other assignments may be more appropriate and more consistent with the intent of the NCLIS. Second, the available data on workloads, costs, and effectiveness of libraries and other information activities is notoriously sparse, inconsistent, and unreliable; data other than that used here may lead to other conclusions.

In any event, Section 2 provides a specific analysis as the basis for the particular answers given to the questions with which this paper is concerned.

SUMMARY OF RESULTS

Those answers can be summarized as follows:

The Economic Rationale for the network is based on two arguments. The first relates to improved operational cost/effectiveness, the second to improved utilization of capital resources. The view with respect to the first is that the evaluation of any information service should be based on the ratio of cost to effectiveness, with effectiveness measured by degree of utilization and average response time. The rationale for the network is that, as a result of relatively small added costs incurred through network operation, significant improvement will be seen in effectiveness - both greatly increased utilization and greatly reduced response time. The view with respect to the second is that our existing system of information resources represents an immense capital investment - in the information resources themselves (the books, the journals, the data bases), in the means for intellectual access to them (the catalogs, the indexes and abstracts, the reference

files), and in the means for physical access to them (the buildings, the computer systems, the communication networks). The creation of the network, by increasing the extent of utilization of these capital resources, will, therefore, improve cost effectiveness not only in an operational sense but in the sense of capital utilization. Perhaps even more important is the view, analogous to that in the development of a transportation system, for example, that the creation of the network will encourage the further development of capital resources, rather than the waste of them.

The Funding Rationale is based on a number of principles, statements in as explicit a form as possible of the basis for funding of any activity in which various levels of government and the private sector must cooperate. Briefly, these principles are as follows:

(1) The individual user of the network should not be charged for the costs of the network in providing him access to sources of information, although he or she may be charged for payments that must be made to the sources of information.

(2) The constituency to which the user and the information resource used both belong should pay for the costs of access to that information resource.

(3) Where constituencies lack the economic base on which to cover the costs of access to information, there should be a basis for equalization and thus a sharing of those costs among other constituencies as well.

(4) Capital costs in the creation and enhancement of information resources, in providing improved means for access to information resources, and in management of the national network should be borne by a mix of local, state, federal, and private funding.

(5) There should be a clear basis for accountability, for relating funds used for information services directly with the services provided, in a uniform and auditable manner.

In Section 4, these principles are described in detail, including the definition of the terms used in them - user, constituency, information resource, equalization, accountability. Then, their application is made to the NCLIS draft program, with specific estimates of their effect. Briefly, the results are as follows:

(1) Local service points - public library branches and small public libraries - should continue to be funded, as they are now, by the local constituency.

(2) Increases in the number of local service points and the addition of service points to serve newly defined constituencies without a geographic base should be funded by a mix of local, state, and federal funds on a matching fund formula that combines population and economic base data.

(3) Local service points in the academic library, special library, and school library contexts should continue to be funded, as they now are, by the institutions that they directly serve.

(4) In all three cases, support for the operation of local service points that lack adequate economic bases should be supplemented from state and federal funds on the basis of an equalization formula that combines population and economic base data.

(5) Libraries and information services identified as system resources, state or regional resources, or national resources should be supported, as they now are, by the constituency they primarily serve, but should be paid from state and federal funds for the services they provide to larger constituencies. The payment should cover not only the direct costs (including overhead) for the services provided but an allocation of the capital costs as well.

(6) The capital costs in creating the network, in developing the data bases needed for intellectual access, and in creating the means for communication should be funded by the federal government.

(7) The capital costs in creating resources - in publishing, in creating new services, in establishing new major resources - should be borne by either the private sector or the constituency they primarily serve.

(8) The capital costs in research and development and in the training of staff should be primarily funded by the institutions responsible for these functions (the universities, for example). However, sufficient federal funds should be provided

to meet the needs generated by the national network.

2. SYSTEMS ANALYSIS

In this section, we provide an analysis of the national network in terms of components, functions, and cost/effectiveness. The components will be analyzed by type of information resource and by level in the network structure. The functions will be analyzed by type of function - operational, developmental, support, and management.

TYPE OF INFORMATION RESOURCE

The present national information system consists of a set of libraries - public, academic, school, special, and governmental - and a set of information services - publishers, information centers, information analysis centers, commercial information providers. It is important to recognize the purposes of each of these, the constituencies that they each serve, the present basis for funding them and the problems it may represent.

The Public Library has had a long and distinguished history as the "university of the people". It has served successive segments of our society as they have moved up the economic scale. It has provided access to literature not simply for educational purposes but for cultural and recreational ones as well. The worker, the immigrant, the newly urbanized - each has found the public library to be a crucial resource. Beyond that, the public library has been the continuing servant to the people of the community as they have achieved economic success.

The constituency of the public library is thus the people as a whole, but with an important limitation. Historically, the public library has grown out of the needs

of specific geographically defined communities. Thus, until recently, the public library was regarded as the responsibility of the local community, to be funded by it (usually out of the property tax base) and to serve its needs. The effects of the Library Services Act and then of the Library Services and Construction Act were to change this pattern to an extent, but even earlier several states had initiated programs to establish county library systems. The fact remains however that the great bulk of public library service - reportedly over 83% - is still funded out of the local tax base.[3]

This fact has created some almost disastrous problems. Some constituencies, especially rural communities, simply do not have the economic base on which to support adequate library service. The funds from LSA and LSCA, while they may have helped some, have been too little to effect much improvement. At the other end of the spectrum, other constituencies - the large metropolitan centers - have faced the maintenance of adequate library service out of a decreasing tax base. More to the point, they do so not solely for the benefit of the immediate constituency but for the benefit of a wider geographic area that covers the surrounding suburban communities and the region. Again, the funds under LSCA, especially Title III, may have helped some but not enough to maintain the urban public libraries as economically viable institutions. Furthermore, most public libraries have been placed in a difficult position in competition for federal funds distributed through "revenue sharing" during the past several years, when the categorical funds for libraries were being impounded.

The Academic Library is indeed the "heart of the university" or college or junior college. It serves the students and faculty of the institution as the primary

educational tool. Even in the smallest college, the library is the source of the literature, the supplementary readings, the journals that the student must read in support of classroom instruction. But in the largest academic institutions, the library is much more. It is frequently the major resource for the region or even the state or multi-state region or nation. It then serves the researcher of all kinds - academic, business, government.

The constituency of the academic library is thus, for the smaller institutions, the immediate faculty and student body; for the larger institutions, the society as a whole. However, in most cases, the academic library is funded from the resources provided to the institution for its primary function - the education of the students and the research by the faculty of the institution itself.

This fact has also created some almost disastrous problems. First, as educational institutions have faced budget cuts over the past few years, the library has all too frequently felt a disproportionate share of the burden. And this has come at the same time that federal funds to supplement library development, under the Higher Education Act, have been curtailed. Second, and from the standpoint of network development, even more important, the burden placed on the larger academic institution, the one that serves as a resource for the much larger community, has steadily increased. Some of these institutions are privately financed, and for them the burden is an almost intolerable one. But even the state supported institutions have found themselves faced with needing to serve a constituency much greater than that for which they are funded.

The School Library serves the immediate instructional needs of the elementary and secondary school students. Its

services are highly focussed on the immediate needs for instruction. It, therefore, depends heavily upon the services of the local public library for the supplementary material it is unable to afford. The funding of the school library, of course, is part of the total budget for support of the school and thus, as does the funding of the public library, it falls upon the local tax base.

The Special Library usually serves a very specific constituency, one defined by the organization of which it is a part. The company library, the law office library, the hospital library, the museum library - these are the primary examples. Their funding comes from the organization that they serve. Some of them are governmental libraries - those serving institutions, for example - and are supported by the government agency of which they are a part. Some of them have represented special funding problems, because the constituency being served - the inmate in the institution - had little say in the character of the service. Federal funds under LSCA to some extent aided in the alleviation of these situations, but the problem still exists.

The Dissemination Center has recently appeared on the scene as a form of information resource different from the library, although much dependent upon the library, and in some cases a part of it. Some dissemination centers are part of industrial corporations and have been funded by them; others are part of academic institutions and have been funded in part by federal funds; and others are commercial services, utilizing data bases from both government and private sources, and funded by the sale of services. The constituency served is usually the staff of the institution, but in some cases (especially the commercial services) includes a community at large.

The Information Analysis Center is an outgrowth of the explosion of scientific and technological development of the past several decades. It is usually part of a governmental agency, a university, a research institute. It serves a constituency defined by the discipline with which it is concerned and provides them with analyses of both literature and data from that discipline.

The Publisher provides the basic record from which information services are provided, usually by the other organizations listed here. Some publishing is commercial, and is funded by direct payment. Some publishing is by professional societies, and is funded by their membership and by other sales (primarily to libraries, of one kind or another). And some publishing is by government and contractors to government, and is funded by government.

The constituency served by the publisher is defined very clearly by the group that funds it, but for some publishers there is an acute problem in the disparity between the costs of publication and the ability of the constituency to pay for those costs. This problem is exemplified by the costs of producing indexing and abstracting services - the basic tools for access to the published literature. It is also exemplified by the similar disparity between the costs of many scientific journals compared with the market for them.

The Library and Information Science Schools provide the professional manpower to serve in these institutions, to develop the systems, and to manage them. Their constituencies are, therefore, not only the students they train, but the institutions in which those students will work as graduates, and the society as a whole that they will serve. In addition, because of the nature of the academic institu-

tion, these schools also serve as places for research and development.

The schools are almost totally funded by the institutions of which they are a part (including the tuition payments by the students), although limited federal funds have been provided under LSCA and the Higher Education Act.

LEVELS OF STRUCTURE

As the basis for any rational analysis of a network, it is necessary to superimpose upon the set of different categories of information agencies outlined above a division into levels of structure, a division roughly related to the geographical range of other institutions that a given one may serve in the network. In this paper, four levels of structure are defined:

(1) Service points, representing the points of entry into the network, the component with the smallest constituency and the most direct relationship to its constituency.

(2) System centers, representing agencies serving a number of service points, some defined on a geographic basis and others on a subject basis.

(3) State and regional centers, representing major resources of a state or region of the country.

(4) National resources, representing those institutions which, because of their size, the quality of their services, or the character of their services, are regarded as national resources.

Service Points are the points of entry into the national network. Some of them may be small public libraries or branch libraries in larger systems; some may be bookmobiles; some may be the libraries of small colleges; some may be special libraries in corporations. They will generally be small in both the amount of material they have immediately on hand and the size of staff to provide services. The collection will (or should) be highly focussed to the needs of the immediate constituency, the people who will come to the institution for information or library service. The service point will generally be physically close to that constituency and will try to orient its services to their specific needs.

System Centers serve a fairly large number of service points. In the case of larger public library systems, the system center is likely to be a part of the system, serving the branch library service points with administrative services and technical services as well as reference services and the back-up information resources. In other cases, the system center will be administratively distinct from the service points it serves, and it will provide only the back-up resources and information services. For example, in the Regional Medical Library structure, the Resource Libraries in a region serve as back-up collections for a geographically distributed set of service points, although they have no formal administrative relationship to them. In the state-wide networks of several states, a designated "reference center" in each region of the state serves as a system center. Other examples are easy to find.

State and Regional Centers are resources of a size and excellence to be regarded and used as the major back-up institutions. They will include the large, state-supported university of the state, the large metropolitan public

library, the major special library (such as a Regional Medical Library), the State Library. They serve primarily the needs for research material, for access to back issues of a large variety of journals, for access to reports, government publications, and similar material of limited use. They will have the major bibliographic tools as well as the major collections.

National Resources include not only the top research libraries of the country - the three national libraries, the half dozen major private university libraries, the three or four major public libraries, the major state-supported universities - but the other information resources as well - the publishers, the commercial information dissemination services, the information analysis centers, the commercial information services.

FUNCTIONAL ANALYSIS

These components, types of institutions at various levels of structure, are responsible for certain functions in the operation of the network. Roughly, those functions can be grouped into four categories: (1) operational functions, (2) support functions (primarily technical services, in the library sense), (3) development functions, and (4) management functions.

Operational Functions are those directly involved in providing access to information resources and providing the information itself. These include all of those activities normally identified as "reader services", including selection as well as book circulation, reference, interlibrary loan, and related activities. Clearly, these are functions performed at all levels of structure and by virtually every type of information agency. In an accounting system using

"cost flow" techniques for accounting, these would be the ultimate units of work. In a market economy, they would be the products to be sold, as illustrated by the services of the commercial components of the network.

Support Functions are those required to acquire, store and provide the means for access to the information resources. They include all of those activities normally identified as "technical services", including acquisition, cataloging, physical preparation, etc. Many of these functions tend to be assigned and performed at the higher levels of structure such as the system centers or state centers. The continuing development of standardized cataloging and related services, such as OCLC or Bibnet, suggests that there is an increasing move to placing these functions at higher levels of structure.

Development Functions are those involved in creating the means for providing information services. They involve capital investments in the creation of data bases, publications, indexing and abstracting journals, means of communication and processing. The magnitude of these investments is great enough that they are likely to be incurred only by or for national resources, with the results then made available for use at the state and sub-state levels. If they represent private investment, the commercial services will require the national market to recover that investment; if they represent public investment, they should be made in the context of value to the total network. Of special significance in this respect are the capital costs involved in creating the national "data base", the machine-readable file of cataloging, indexing, and abstracting data that represents the fundamental tool for both intellectual and physical access to information resources. This is a major investment, presently being made

piece-meal (except for the current cataloging provided by MARC tapes) by various state agencies, academic institutions, and major public libraries. Equally important, although significantly less in magnitude, are the costs involved in creating the communication systems for access to these data bases and to the information agencies. Fortunately, the major investment in this regard has been made in the creation of the communication system, the computer networks, and the existing services based on them.

Management Functions are those involved in the network operation itself (although it should be recognized that they are necessary in the operation of each of the individual agencies). The present pattern in development of networks has placed much of the responsibility on state agencies (such as the state library in many states). Beyond that, however, there has been little, if any, "management" of the national system. There is no "national library", even though the Library of Congress has the resources and position to be it. There has been little direction provided by the Office of Education, beyond merely administering the funds from various library and information related legislation. The shining exception is the management that has been provided by the National Library of Medicine in its formulation and support to the Regional Medical Library Network. The draft program of the NCLIS specifically addressed this problem in one of its objectives:[4]

> Objective 7. Establish a locus of federal responsibility charged with implementing the national network and coordinating the National Program under the policy guidance of the National Commission.

SYSTEM MATRICES

Given the array of components (information agencies)

and functions, we want to get some picture of the relationships among them, hopefully with some general quantification of cost/effectiveness. In this position paper, there is neither the time nor the information on which to base a detailed system matrix. We will limit it to merely the detail provided by the four levels of structure and the four classes of function.

FIGURE 1

QUANTITATIVE CHARACTERIZATION
OF COMPONENTS

(The following data are intended as indicative, not as either prescriptive or accurate descriptions of the quantitative character of existing library and information activities.)

COMPONENT	NUMBER	TOTAL BUDGET
Local Service Points		
Public Library	12,000	$650 million
School Library	60,000	500 million
Academic Library	3,000	260 million
Special Library	8,000	200 million
System Centers		
Public Library	250	100 million
School Library	1,000	120 million
Academic Library	250	120 million
Special Library	250	50 million
State & Region Resources		
Public Library	20	30 million
School Library		
Academic Library	120	220 million
Special Library	100	50 million
National Resources		
Public Library	4	30 million
School Library		
Academic Library	20	140 million
Special Library	20	60 million

FIGURE 2

PRESENT DISTRIBUTION OF BUDGETS
AMONG FUNCTIONS

(The following data are intended as indicative and not as accurate descriptions of the actual distribution of operating budgets.)

COMPONENTS / FUNCTIONS	LOCAL SERVICE POINTS	SYSTEM CENTERS	STATE & REGION RESOURCES	NATIONAL RESOURCES
Operational Functions	$ 1,000 M	$ 200 M	$ 140 M	$ 100 M
Support Functions	610 M	160 M	150 M	127 M
Development Functions *				
Management Functions		30 M	10 M	3 M

* Development functions are presently the primary responsibility of commercial and society publishing activities and information services, with some degree of government support.

FIGURE 3

INPUT/OUTPUT MATRIX
(SOURCES OF FUNDS VS.
THEIR DESTINATIONS)

(The following data are intended as indicative and not as accurate descriptions of the actual distribution of funds.)

INPUT \ OUTGO	LOCAL SERVICE POINTS	SYSTEM CENTERS	STATE & REGION RESOURCES	NATIONAL RESOURCES
Private	$ 500 M	$130 M	$ 50 M	$30 M
Local Community	1,090 M	240 M	30 M	30 M
States	10 M	10 M	215 M	90 M
National	10 M	10 M	5 M	80 M

(1) In addition, the private sector also incurs costs, estimated at $100 million per year, in creating the data bases from which information services are provided.

(2) In addition, private and public educational institutions presently incur costs, estimated at $50 million per year, in education of librarians and library technicians, and other staff.

3. RATIONALE FOR NETWORK DEVELOPMENT

In the previous section, we have tried to present the array of components and functions that the NCLIS draft program, in principle, will link together, with proper assignment of functions, to achieve the goal:[5]

> "To eventually provide any individual in the U.S. with equal opportunity of access to that part of the total information resource which will satisfy his educational, working, cultural, and leisure-time needs and interests, regardless of the individual's location, ocial or physical condition, or level of intellectual achievement."

We now face the task of providing a rationale for the development of a library and information network to meet this goal. What justification, economic or otherwise, can there be, beyond the obvious ethical value in the goal? What makes the goal itself justifiable? And more to the economic issue, what makes the development of the network the best way to achieve the goal?

VALUE OF INFORMATION

The obvious way to answer these questions is to demonstrate the economic value of information, and there have been several efforts to do so. Perhaps one can show that there is increased productivity if information resources are used? Or maybe we can show the savings in research and development costs if only the engineers had used published results of prior work? Perhaps it can be shown that personal income is increased if good library service is available? (Or is it the other way around?)

Obvious though such an approach may be, it has not been successfully followed, except perhaps in the most evident situations, where the question was not really in doubt anyway. But more importantly, the approach is probably not a valid one and may destroy more than it could accomplish. The flaw lies in adopting the economist's dictum that "cost equals value". It lies in equating the purpose of any institution with purely economic measures of its performance. It is equivalent to measuring the value of a man by something like "the present value of his expected, actuarial, life's income". It becomes concretely realized when someone says, "Let's sell the university's library in order to have the money we need to run the university."

Even in its most obvious application - to the management of modern corporate enterprise - equating of the purpose of a company with merely producing profit would rapidly destroy any company that seriously adopted it. The purpose of IBM is to produce computers, not money; of General Motors, cars, not money; of John Wiley & Sons, books, not money. Profit is essential for the success and continued operation of those companies, but it's not the measure of their value to society.

In the same sense, then, the value of a library or of the information it provides is not measurable in economic terms, even though its success and continued operation depends upon the willingness of people to support it. In this paper we do not attempt to evaluate information in economic terms. Instead, we will accept it as a "good" in itself, with the measure of its value being the extent to which information is used, for whatever reason it may be used.

There is one point that might be made, however, about

the economic value of information. It seems likely that that value lies not in the economic benefit to the individual but rather to society as a whole. Except in very specific circumstances, it is probably as economic for the individual to proceed without information, if he had to pay for it, but it would be a great loss for society. The loss, in purely economic terms, is cumulative over all the individuals who make decisions without adequate information. It is the classic paradox of the "commons", in which the economic decision by the individual is at variance with the total economic value to society. (6)

COST/EFFECTIVENESS

In contrast to the attempt to equate the value of information with purely economic measures, it is the view of this paper that information systems - and the national library and information network in particular - should be measured in terms of their cost/effectiveness. This may appear obvious, but there are several aspects of this view that need to be stated explicitely.

First, cost/effectiveness is a measure of performance that is expressed as a ratio of cost to performance. The word ratio is emphasized to distinguish this measure from a difference measure, in which essentially one is simply comparing costs with benefits expressed in economic terms. The effectiveness of an information system is expressed in terms other than dollars. In comparing two systems, say the present library system and the NCLIS draft network, one is comparing the effectiveness per dollar spent. The system that provides the best performance - expressed in terms appropriate for measuring performance - per dollar spent is the best system. This may mean better performance for the same dollars; it may mean fewer dollars for the same

performance. Usually it has meant significantly greater performance for slightly more dollars.

Second, the measurement of the performance of an information system, even if the economic measure is rejected, is by no means simple or obvious. For the purposes of this paper, however, we will adopt a measure of the form

$$N/T$$

where N measures the extent of utilization and T measures the response time of the information system. Thus an information system is more effective if it has greater utilization, or if it provides information more rapidly.

Third, the measurement of cost, while by its nature simpler than the measurement of performance, is by no means trivial, especially with respect to information services. Costs of library operation are only now beginning to be measured with any degree of consistency. More basically, there is still no valid accounting standard for handling the capital investment represented by the information resource itself, or the investment in the means for intellectual or physical access to it. How should that investment be amortized, especially in view of the fact that some information resources increase in value with time and with their utilization? Because there is no accounting standard, the two kinds of costs - operating costs and capital costs - will be separately treated in this section.

If we then consider the cost/effectiveness measure of performance of an information system as having the form

$$CT/N$$

it is clear that a network would be of value if it decreased cost, decreased response time, or increased utilization. But as it has been suggested, usually one depends upon increased effectiveness for a relatively small

increase in cost.

The view that an information network would reduce costs is implicit in most of the present planning for sharing of resources among libraries. The view is that one copy of a book or journal can serve the needs that several copies might have met, thus reducing the costs. Such a basis for justification of library cooperation is frightfully short-sighted. In fact, the likely result of such an approach is a significant increase in response time and a reduction of utilization - a net loss in cost/effectiveness. The rationale of cost savings as the basis for network development would be self-defeating. In fact, it is almost certain that a national library and information network is going to cost more than the present system does. That means that the rationale must be based on improved effectiveness. Is this likely?

Increased effectiveness is not only likely, but if certain well documented facts about library utilization are recognized, it is certain. Specifically, there are thoroughly documented data that show that the utilization of an information system is inversely related to the physical distance between the user and the resources.[7] In fact, the inverse relationship is apparantly an inverse square law:

$$\text{Utilization} = k/(\text{distance})^2$$

This has been documented for libraries; it has even been reported at distances on the order of 50 to 100 feet.[8] This suggests that if the network design incorporates the principle of increasing the number of local service points - thus bringing the information services closer to the users - there will be a significant increase in the degree of utilization. Specifically, a 25% increase in the number of local service points would, assuming this inverse square

law holds true, result in an increase in utilization by over 50%.

It is also likely that the utilization of an information resource is inversely related to the response time - the smaller the response time, the greater the utilization. (In fact, this may be the underlying phenomenon for the inverse square law for distance.) The very purpose of the network is to make the total information resources of the country more readily available, and to the extent this is successful it is certain to increase utilization. But the results are a two-fold improvement in effectiveness, combining reduced response time with the resulting increase in utilization.

In summary, if the network design incorporates both an increased number of local service points and an improved response time in access to material (through improved means for both intellectual and physical access), there will be a vast increase in the total utilization and an even greater increase in total effectiveness. To illustrate, suppose the national network, through proper investment of an increase in costs by 25%, added 25% to the number of local service points and cut the response time in half. The resulting cost/effectiveness ratio would then be less than half that presently - a most significant improvement in the cost/effectiveness of operations.

ECONOMIC UTILIZATION OF CAPITAL

Now, let's examine the utilization of capital resources. There is a truly immense capital investment in information resources in the United States. Consider just the buildings dedicated to libraries! But even greater than that investment is the capital investment in the collections of the major research libraries of the country and in

the catalogs and other means of access to those collections. A conservative estimate would put that investment on the order of ten to twenty billion dollars. And the collections of those major research libraries are unusual capital resources in the respect that their value steadily increases rather than decreases over time.

However the accounting for that capital resource may be handled, the fact remains that it is there and that any increase in utilization of it would represent a gain in total system productivity. It's as though there were a manufacturing plant available to a company that was producing only half of the output it was capable of.

Again, the rationale for the network comes down to increased utilization, but that is the result to be expected from the increased accessibility that is the stated goal of the NCLIS draft program.

ECONOMIC UTILIZATION OF STAFF

Returning to the issue of operating costs, the most significant proportion of them usually goes to support of staff. The effect of the network with respect to these operating costs in particular will be two-fold. First, there should be more effective utilization of support staff through the economies of scale that network operation will provide. Second, as a result, a greater proportion of staff should be in direct service to users, rather than in support functions or technical services.

FIGURE 4

COMPARISON OF RESPONSE TIMES
ESTIMATED PRESENT VS.
HYPOTHETICAL FUTURE

	Present		Future	
	Distribution of Activity	Response Time	Distribution of Activity	Response Time
System Centers	80%	3 days	80%	2 days
State & Region	16%	10 days	16%	3 days
National Resources	4%	30 days	4%	10 days
Average		5.2 days		2.5 days

(The figures for both distribution of (referral) activity and of response time are indicative and not intended as accurate.)

FIGURE 5

ESTIMATED CAPITAL INVESTMENT

(The following figures are intended as indicative and not as accurate descriptions of the present capital investment in libraries.)

INVESTMENT IN
COLLECTIONS

	VOLUMES	COST	TOTAL
Service Points	(not a capital resource)		
System Centers	500 million volumes	$13	$6500 million
States & Regions	200 million volumes	$22	4400 million
National Resources	100 million volumes	$30	3000 million

(Cost includes acquisition, purchase, cataloging, and processing)

INVESTMENT IN
BUILDINGS

	VOLUMES	COST	TOTAL
Service Points	400 million volumes	$2	$ 800 million
System Centers	500 million volumes	$3	1500 million
States & Regions	200 million volumes	$5	1000 million
National Resources	100 million volumes	$5	500 million

(Cost incluces space for storage, for reader utilization, and for library staff)

TOTAL CAPITAL INVESTMENT $17700 million

4. RATIONALE FOR NETWORK FUNDING

We now turn to the second fundamental question: How should the funding for the network be distributed among the various institutions involved? In order to provide an answer to that question, there are some basic principles that should be identified. Given them, one can then see what the resulting fiscal implications would be for each sector of society and each level of government.

BASIC PRINCIPLES OF FUNDING

Five basic principles have been extracted from the general description of the NCLIS draft program, from the present legislation, and from a picture of what appear to be the objectives of legislators in funding projects of this kind.

The Individual User of the network should not be charged for the costs of the network in providing him access to sources of information (although he or she may be charged for payments that must be made to the source of information - a commercial service, for example). To an extent, this is a controversial principle, one that the private sector - the "information industry" - might find objectionable. It certainly goes counter to the principles of free enterprise, of the free action and choice of the market place, of the economic evaluation of any product or service. On the other hand, it is a principle explicitely embodied in our free public library tradition, in the professional practice of all librarians toward the constituencies they serve. Few libraries charge the individual user from the constituency they serve for library services, whether they be public, academic, school, or special libraries. Oh, there are certain costs that will be

charged to the patron - the costs of photocopying, for example, or the costs for purchase of material intended directly and solely for the use of the patron - but the basic services will be provided free of charge to the individual.

The Constituency to which the User and the Information Resource both belong should pay for the operating costs of access to that information resource (these will be primarily costs for staff and supplies or expenses). This principle is at complete variance with the present practice of interlibrary loan, in which a principle of reciprocity is assumed to apply instead. Specifically, present practice expects the borrowing library and the lending library each to bear what ever costs it may incur in providing service to the patron of the borrowing library. Historically, the fiction of reciprocity may have been acceptable, but even today the burden it places upon the major resource libraries of the country has reached intolerable size. The effects of the national network, if the intent of greater utilization is in fact to be met, will be to vastly increase the magnitude of that burden. Hence, the principle of payment for services provided. However, it is important to note the wording of this principle, the constituency to which both the patron and the resource belong. In other words, the costs of using a resource should not be borne by the local service point; rather they should be borne by the larger units that encompass both the local service point and the resource. Thus, if a system center or a state resource were to be used, the costs should be paid by the state (and, as we shall suggest in a moment, the federal government); if a national resource were to be used, by the federal government.

Where Constituencies Lack the Economic Base on which to cover the operating costs of access to information,

there should be a basis for equalization and thus a sharing of those costs among other constituencies as well. This principle is so well embedded in our legislative policy, at both a federal and state level, that it hardly needs definition. Most recently, however, it has been given special emphasis by the Supreme Court in its rulings on equalization of educational access. It therefore seems especially appropriate to emphasize it here as well. Furthermore, there are certain aspects of the NCLIS draft program for which it has special meaning. First, let's look at the obvious implications of this principle. Communities and even states which are economically poorer than other communities or states should receive more state and federal funds than the average so as to provide a greater level of equality among all of the citizens. Second, let's look at the less obvious implications. There are certain constituencies for which there is no definable economic base - the poor, the illiterate, the physically handicapped, the ethnic minorities, the Indians on reservations, migrant workers, etc. For such groups, special provisions of support for their access to the information network will need to be made.

Capital Costs in the creation and enhancement of information resources, in providing improved means of access to information resources, and in management of the national network should be borne by a mix of local, state, federal, and private funding. There are several specific areas to which this principle has special applicability. First, part of the network planning should be the increase in the number of local service points. This has the aim, as described earlier, of increasing the degree of utilization by making the resources more accessible. However, there are significant capital costs involved in establishing such

local service points - buildings, basic collections, etc. Those capital costs will need to be borne by the local community, but with the support, through matching funds, from the state and federal government. Second, another part of the network plan should be the improvement of the means for intellectual access. Again, there are significant capital costs involved in doing so, costs in creating the reference data bases and costs in producing the information services based on them. The first, the costs of creating the data bases, should be borne in large part by the federal government; the second, the costs of producing the information services, should be borne by the private sector or by various resource organizations. Third, the management of the national network should be borne by the federal government.

There Should Be a Clear Basis for Accountability, for relating funds used for information services directly with the services provided, in a uniform and auditable manner. This principle is counter to the concepts of "revenue sharing", as exemplified in the practice followed in the recent administration. In effect, it states that the aim is not redistribution of funds, but the improvement of services and the compensation for services provided. This principle is already embodied in the operations of the Regional Medical Library Network and in the operation of the New York State Interlibrary Loan Network (NYSILL). It represents neither an impossible accounting burden nor a significant departure from normal practice. It simply makes it a principle for network funding.

OPERATIONAL FUNDING

Applying these principles, especially the second one, to the funding at various levels of network components, one

derives the following consequences:

(1) The operation of local service points should be paid for by the local constituency served (subject, as we will see later, to the principle of equalization). This means the local community continues to pay for its small library systems or branch libraries in larger systems; it means the college continues to pay for its own library; the business for its library; the school system for its library.

(2) The operation of system centers should be funded by a mix of funding, the bulk from the local constituency, but a significant portion from state (and federal) funds. Presently, the costs of these systems centers - the main libraries of the library systems of each state - are borne by the central city of the metropolitan areas. But each of them provides the resource library for a much larger region than its own constituency. On the average, for example, the central city represents only about 31% of the population; the surrounding metropolitan area, suburbs and other communities, represents 42% of the population; and the surrounding rural areas, 26% of the population. Thus, 31% of the population is supporting a resource that should be used by 100%. Applying the second principle, the use of the system centers by the surrounding communities should be paid for by the state government based, according to the fifth principle, on an accounting of services provided.

(3) The operation of state resources or of national

resources should be funded in a similar manner, with much the same rationale.

EQUALIZATION FUNDING

The principle of equalization seems reasonably clear, but the practice is much less clear. However, there is a formula embodied in the LSCA that, on the surface at least, seems equitable. Stated in its simplest form, it says that federal funds should be provided in proportion to population and that state and local funds should match in proportion to economic level. Although this may still leave some inequities (the rich communities still have more resources to spend), it is difficult to find a formula that would work as well. Applying the principle of equalization, using this formula or some other one, at various levels of the network, one derives the following consequences:

(1) There are large sections of the country where library service is so geographically far away that it is virtually inaccessible. Application of the equalization formula should be used to increase the number of local service points in those rural areas.

(2) At the other end of the spectrum, there are metropolitan areas in which the branches serve such a large population group that they are saturated, with insufficient funds to meet the needs, to provide the space, to have an adequate local collection. Again, application of the equalization principle should increase the number of branch libraries in these urban centers.

(3) Certain population groups have no identifiable

economic base and yet they have clearly identifiable and unique requirements for library and information services. Again, application of the equalization formula should be used to provide means of local access to the national network for them.

CAPITAL FUNDING

There are several needs for funding of capital requirements. Applying the principle of a mix of funding, one derives the following consequences:

(1) The addition of local service points will involve major capital costs as well as operating costs. Those capital costs should be funded by a matching of federal, state, and local funds, equally.

(2) The maintenance of system centers, state resources, and national resources requires a significant capital investment in buildings, acquisitions, and cataloging and indexing. These capital costs should be covered by the local constituency and state and federal funds in proportion to the identifiable utilization to be expected.

(3) The capital costs in creating the national data base should be covered by the federal government. A specific case in point is the conversion of the retrospective catalogs of the major national resources. Another case in point is the continuing creation of the data bases of indexing and abstracting data - the tools for access to the journal and report literature.

(4) The national network will involve the use of sophisticated computer systems and communication systems for access to data bases, for transmission of requests and related messages, and for accounting. The federal government should cover the capital costs in creating the technical network.

(5) The maintenance of the network will require the continued research and development of techniques and the training of staff. The federal government should fund a portion of the costs of academic institutions involved in such work.

FIGURE 6

BASES FOR EQUALIZATION

(The following data, except for the numbers of public library service points, are taken from Statistical Abstract of the United States, 1971. Those for numbers of public library service points are indicative and are not expected to be accurate.)

	SQUARE MILES, AREA	POPU.	DOLLARS INCOME	PUB. LIB. SERV. PTS.	RATIOS TO AREA	RATIOS TO POPU.	RATIOS TO INCOME
New England	67 K	12 M	47 B	1000	67	12 K	47 M
Middle Atlantic	103 K	37 M	155 B	2500	40	15 K	62 M
South Atlantic	279 K	31 M	100 B	1500	180	20 K	67 M
E. N. Central	248 K	40 M	157 B	2500	100	16 K	63 M
E. S. Central	182 K	13 M	35 B	600	300	20 K	58 M
W. N. Central	517 K	16 M	57 B	1000	520	16 K	57 M
W. S. Central	439 K	19 M	57 B	800	550	24 K	71 M
Mountain	864 K	8 M	27 B	600	1430	14 K	45 M
Pacific	917 K	27 M	108 B	2000	460	13 K	54 M

K indicates thousand, M indicates million, and B indicates billion

FIGURE 7A

EFFECTS OF PROPOSED
FUNDING CRITERIA

A. OPERATING COSTS

COMPONENT / SOURCE	LOCAL SERVICE POINTS	SYSTEM CENTERS	STATE & REGION RESOURCES	NATIONAL RESOURCES
Private	$500 M	$100 M	$30 M	$20 M
Local Community	1700 M	100 M	20 M	30 M
State	60 M	100 M	300 M	125 M
Federal	60 M	100 M	50 M	125 M

These figures should be compared with those of Figure 3.

FIGURE 7B

EFFECTS OF PROPOSED
FUNDING CRITERIA

B. CAPITAL COSTS (PER YEAR)

SOURCE	CAPITAL REQ'MENT	LOCAL SERVICE POINTS	DATA BASE DEVELOP.	NETWORK SYSTEM DEVELOP.	EDUCATION & RESEARCH
Private			$170 M		$ 5 M
Local Community		$20 M			10 M
State		20 M			35 M
Federal		20 M	30 M	$10 M	5 M

FIGURE 8

COMPARISON OF FISCAL BURDEN

PRESENT VS. PROPOSED

	PRESENT	FUTURE		
	OPERATIONAL	OPERATIONAL	CAPITAL	TOTAL
Private	$ 710 M	$ 660 M	$ 175 M*	$ 835 M
Local Community	1,160 M	1,160 M	30 M	1,190 M
State	435 M	625 M	55 M	680 M
National	235 M	475 M	65 M	540 M

* Private capital investment includes that for development of services

COST/EFFECTIVENESS

	Cost	Estimated Response Time	Estimated Utilization	C/E
Present	$ 2,530 M	5 days	2 billion	6.6
Projected	3,245 M	3 days	3 billion	3.1

5. REFERENCES

1. A National Program for Library and Information Services. Washington, D. C.: The National Commission on Libraries and Information Science, 15 September, 1974.

2. Reference 1, paraphrased.

3. Rodney P. Lane, Basic Issues in the Governmental Financing of Public Library Services. New York: Columbia University, May 1973.

   However, this quoted figure (83%) should be treated with caution. It is based on data several years old and does not reflect inflation or recent changes in funding patterns. Furthermore, it does not recognize the contribution from other local sources of funds, such as private endowments.

4. Reference 1, page 65.

5. Reference 1, page 4.

6. G. Hardin, "The Tragedy of the Common", Science 162, 13 December 1968, page 1243.

7. Robert E. Coughlin and others, Urban Analysis for Branch Library System Planning, Westport, Connecticut: Greenwood, 1972.

8. Data reported by a commercial company marketing a microfilm catalog reference system.